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| 6 | 6,842,899 | T | Apparatus and method for resource negotiations among autonomous agents |
| 7 | 6,842,780 | T | Method of management in a circuit-switched communication network and device which can be used as a node in a circuit-switched communication network |
| 8 | 6,636,781 | T | Distributed control and coordination of autonomous agents in a dynamic, reconfigurable system |
| 9 | 6,192,354 | T | Apparatus and method for optimizing the performance of computer tasks using multiple intelligent agents having varied degrees of domain knowledge |
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| 11 | 6,068,073 | T | Transformable mobile robot |
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IEEE CNF IEEE Conference Proceeding

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5-8 Dec. 2005 Page(s):280 - 288
Digital Object Identifier 10.1109/EPIA.2005.341231
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13-14 Nov. 1998 Page(s):304 - 311
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Ho, L.T.W.; Mullany, F.J.; Claussen, H.; Samuel, L.G.;

Autonomous Decentralized Systems, 2005. ISADS 2005. Proceedings

4-8 April 2005 Page(s):719 - 724

Digital Object Identifier 10.1109/ISADS.2005.1452181

AbstractPlus | Full Text: PDF(1883 KB) IEEE CNF

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7. Steering behaviors for autonomous vehicles in virtual environments

Hongling Wang; Kearney, J.K.; Cremer, J.; Willemsen, P.;

Virtual Reality, 2005. Proceedings, VR 2005, IEEE

12-16 March 2005 Page(s):155 - 162

Digital Object Identifier 10.1109/VR.2005.1492769

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- 1 [Posters: negotiation and agreement II: A negotiation model for autonomous agents: key features and comparison with existing models](#)

Fernando Lopes, A. Q. Novais, Nuno Mamede, Helder Coelho

 July 2005 **Proceedings of the fourth international joint conference on Autonomous agents and multiagent systems AAMAS '05**

Publisher: ACM Press

 Full text available: [pdf\(243.39 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This paper presents the key features of a new negotiation model for autonomous agents. The model is generic, handles multi-party and multi-issue negotiation, acknowledges the role of conflict as a driving force of negotiation, formalizes a set of human negotiation procedures, allows the dynamic addition and removal of issues, and accounts for a tight integration of the individual capability of planning and the social capability of negotiation. This paper also characterizes the model along a set ...

Keywords: autonomous agents, conflict of interests, negotiation

- 2 [Industry track: Automating supply chain negotiations using autonomous agents: a case study in transportation logistics](#)

Sander van der Putten, Valentin Robu, Han La Poutré, Annemiek Jorritsma, Margo Gal

 May 2006 **Proceedings of the fifth international joint conference on Autonomous agents and multiagent systems AAMAS '06**

Publisher: ACM Press

 Full text available: [pdf\(289.41 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This paper presents a case study for the application of agent-mediated negotiation techniques in transportation logistics. More specifically, we consider the interaction between several logistics service providers negotiating over the allocation of transportation orders. In this context, we show that automated negotiation techniques (especially multi-issue or multi-item negotiation) can bring significant advantages, by allowing parties to discover jointly profitable bundles (allocations) of orde ...


Keywords: automated negotiation, multi-agent systems, supply chain management, transportation logistics

- 3 [Agent-based service composition through simultaneous negotiation in forward and reverse auctions](#)

Chris Preist, Claudio Bartolini, Andrew Byde

 June 2003 **Proceedings of the 4th ACM conference on Electronic commerce EC '03**

Publisher: ACM Press

Full text available:  pdf(137.04 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

Service composition is the act of taking several component products or services, and bundling them together to meet the needs of a given customer. In the future, service composition will play an increasingly important role in e-commerce, and automation will be desirable to improve speed and efficiency of customer response. In this paper, we consider a service composition agent that both buys components and sells services through auctions. It buys component services by participating in many Engli ...

Keywords: agent, auctions, bidding, service composition

4 Argumentation and negotiation: Adaptive agent negotiation via argumentation



Antonis Kakas, Pavlos Moraitis

May 2006 **Proceedings of the fifth international joint conference on Autonomous agents and multiagent systems AAMAS '06**

Publisher: ACM Press

Full text available:  pdf(292.69 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

In this paper, we study how argumentation can be used as a basis for negotiation between autonomous agents, where negotiation strategies of the different parties are represented as argumentation theories within their knowledge. We propose an argumentation based negotiation protocol in which offers by the negotiating parties are linked to different arguments that they can build according to their individual negotiation strategy. This protocol is able to take into account the different roles of ag ...

Keywords: argumentation, negotiation

5 Argumentation and negotiation: Negotiating using rewards



Sarvapali D. Ramchurn, Carles Sierra, Lluis Godo, Nicholas R. Jennings

May 2006 **Proceedings of the fifth international joint conference on Autonomous agents and multiagent systems AAMAS '06**

Publisher: ACM Press

Full text available:  pdf(342.93 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

In situations where self-interested agents interact repeatedly, it is important that they are endowed with negotiation techniques that enable them to reach agreements that are profitable in the long run. To this end, we devise a novel negotiation algorithm that generates promises of rewards in future interactions, as a means of permitting agents to reach better agreements, in a shorter time, in the present encounter. Moreover, we thus develop a specific negotiation tactic based on this reward ge ...

Keywords: argumentation, bargaining, persuasive negotiation

6 Papers: negotiation and agreement I: Modeling complex multi-issue negotiations using utility graphs



Valentin Robu, D. J. A. Somefun, J. A. La Poutré

July 2005 **Proceedings of the fourth international joint conference on Autonomous agents and multiagent systems AAMAS '05**

Publisher: ACM Press

Full text available:  pdf(382.28 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

This paper presents an agent strategy for complex bilateral negotiations over many issues with inter-dependent valuations. We use ideas inspired by graph theory and probabilistic influence networks to derive efficient heuristics for negotiations about multiple issues. Experimental results show --- under relatively weak assumptions with respect to the structure of the utility functions - that the developed approach leads to Pareto-efficient outcomes. Moreover, Pareto-efficiency can be reached wit ...

Keywords: decision theory, game theory, graphical models, influence diagrams, market-based methods, negotiation, utility graphs

7 Task and resource allocation: How equitable is rational negotiation?



Sylvia Estivie, Yann Chevaleyre, Ulle Endriss, Nicolas Maudet

May 2006 **Proceedings of the fifth international joint conference on Autonomous agents and multiagent systems AAMAS '06**

Publisher: ACM Press

Full text available: pdf(237.37 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Notions of fairness have recently received increased attention in the context of resource allocation problems, pushed by diverse applications where not only pure utilitarian efficiency is sought. In this paper, we study a framework where allocations of goods result from distributed negotiation conducted by autonomous agents implementing very simple deals. Assuming that these agents are strictly self-interested, we investigate how equitable the outcomes of such negotiation processes are. We first ...

Keywords: fair division, multiagent resource allocation, negotiation, social welfare

8 A Cooperative Negotiation Protocol for Physiological Model Combination

Nicola Gatti, Francesco Amigoni

July 2004 **Proceedings of the Third International Joint Conference on Autonomous Agents and Multiagent Systems - Volume 2 AAMAS '04**

Publisher: IEEE Computer Society

Full text available: pdf(446.30 KB) Additional Information: [full citation](#), [abstract](#), [index terms](#)

The global model of a complex phenomenon can emerge from the cooperative negotiation of agents embedding local partial models of the phenomenon. We adopted this approach to model complex physiological phenomena, such as those related to the metabolism of glucose-insulin and to the determination of the heart rate (pacing). In this paper we formally describe and analyze the properties of a cooperative negotiation protocol we developed to allow the agents to produce a global coherent model of a phy ...

9 Argumentation and negotiation: Negotiation-based coalitions in the physical world



Majid Ali Khan, Ladislau Bölöni

May 2006 **Proceedings of the fifth international joint conference on Autonomous agents and multiagent systems AAMAS '06**

Publisher: ACM Press

Full text available: pdf(245.22 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

We present a negotiation based coalition formation scheme for autonomous agents residing in the physical world. While in the virtual world we can abstract the negotiation into a calculation of rewards and ignore the details of the physical substrate of the negotiation, in the physical world we need to concern ourselves with variables such as the geographical location of the agent, range of the communication devices, path planning, obstacles and hazards, the necessity of co-location and the tempo ...

10 Papers: argumentation and dialog: Formal handling of threats and rewards in a negotiation dialogue



Leila Amgoud, Henri Prade

July 2005 **Proceedings of the fourth international joint conference on Autonomous agents and multiagent systems AAMAS '05**

Publisher: ACM Press

Full text available: pdf(346.26 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Argumentation plays a key role in finding a compromise during a negotiation dialogue. It may lead an agent to change its goals/preferences and force it to respond in a particular way. Two types of arguments are mainly used for that purpose: *threats* and *rewards*. For

example, if an agent receives a threat, this agent may accept the offer even if it is not fully "acceptable" for it (because otherwise really important goals would be threatened). The contribution of this paper is twofold ...

Keywords: argumentation, negotiation

11 Simulation and modeling: Power and negotiation: lessons from agent-based participatory simulations



Paul Guyot, Alexis Drogoul, Shinichi Honiden

May 2006 **Proceedings of the fifth international joint conference on Autonomous agents and multiagent systems AAMAS '06**

Publisher: ACM Press

Full text available: pdf(293.53 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Participatory simulations are conducted to improve our knowledge of human behaviors, to help in solving conflicts, to shape interaction protocols between humans and to teach some aspects of collective management. Agent-based participatory simulations differ from other kinds of participatory simulations including role playing games and experimental economics simulations. The control architecture of the agents, in these simulations, is more or less integrally replaced by a human player and the inte ...

Keywords: agent-based simulations, negotiations, participatory simulations, power relations

12 Posters: negotiation and agreement II: Experimental analysis of negotiation meta strategies



Raquel Ros, Carles Sierra

July 2005 **Proceedings of the fourth international joint conference on Autonomous agents and multiagent systems AAMAS '05**

Publisher: ACM Press

Full text available: pdf(302.65 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

In this paper we present a meta strategy that combines two negotiation tactics. The first one based on concessions, and the second one, a trade-off tactic. The goal of this work is to demonstrate by experimental analysis that the combination of different negotiation tactics allows agents to improve the negotiation process and as a result, to obtain more satisfactory agreements. The scenario proposed is based on two agents, a buyer and a seller, which negotiate over four issues. The paper present ...

Keywords: automated negotiation, multi agent systems, negotiation strategies

13 Role and resource allocation in MAS: Cooperative negotiation in a multi-agent system for real-time load balancing of a mobile cellular network



John Bigham, Lin Du

July 2003 **Proceedings of the second international joint conference on Autonomous agents and multiagent systems AAMAS '03**

Publisher: ACM Press

Full text available: pdf(1.27 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

A cooperative negotiation approach for the real-time control of cellular network coverage is described. The performance of the whole cellular network is improved by contracting and shaping the antenna radiation pattern around traffic "hot spots" and expanding adjacent cell coverage to fill in the coverage loss. The paper shows that the local area real time cooperative negotiation between base stations leads to a near global optimal coverage agreement which is reached in the context of the whole ...

Keywords: cooperative negotiation, load balancing, multi-agent systems, real-time

systems

14 Game theory (I): Optimal agendas for multi-issue negotiation



Shaheen Fatima, Michael Wooldridge, Nicholas R. Jennings

July 2003 **Proceedings of the second international joint conference on Autonomous agents and multiagent systems AAMAS '03**

Publisher: ACM Press

Full text available: pdf(245.66 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

There are two ways of handling bilateral multi-issue negotiations -- one is to negotiate all the issues together, and the other is to negotiate them one by one. The order in which issues are negotiated in issue-by-issue negotiation is specified by the agenda, which can be defined in two ways. One way is to decide it *exogenously*, i.e., before negotiation begins. The other way is to let the players decide which issue they will negotiate next, during the process of negotiation, i.e., the age ...

Keywords: agendas, game-theory, multi-issue negotiation

15 Session 1B: bidding and bargaining agents I: Multi-issue negotiation under time constraints



Shaheen S. Fatima, Michael Wooldridge, Nicholas R. Jennings

July 2002 **Proceedings of the first international joint conference on Autonomous agents and multiagent systems: part 1 AAMAS '02**

Publisher: ACM Press

Full text available: pdf(148.83 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

This paper presents a new model for multi-issue negotiation under time constraints in an incomplete information setting. In this model the order in which issues are bargained over and agreements are reached is determined endogenously as part of the bargaining equilibrium. We show that the sequential implementation of the equilibrium agreement gives a better outcome than a simultaneous implementation when agents have like, as well as conflicting, time preferences. We also show that the equilibrium ...

Keywords: agendas, game theory, negotiation

16 Session 1B: bidding and bargaining agents I: A negotiation model of incomplete information under time constraints



Cao Da-Jun, Xu Liang-Xian

July 2002 **Proceedings of the first international joint conference on Autonomous agents and multiagent systems: part 1 AAMAS '02**

Publisher: ACM Press

Full text available: pdf(233.79 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

As far as the architecture of one-to-one negotiation for practical use is concerned, what kind of equilibrium strategy should a negotiation agent follow when it faces the pressure of its deadline, as well as the uncertainties about the types and the deadlines of its opponents? This paper presents a strategic model for negotiation of alternative offers with a formal game theory, gives a definition of equilibrium combination for negotiation of alternative offers, provides equilibrium strategies ba ...

Keywords: agent, bargaining, game theory, negotiation

17

Multiagent systems and electronic markets track: A decentralized model for multi-attribute negotiations



Guoming Lai, Katia Sycara, Cuihong Li

August 2006

Proceedings of the 8th international conference on Electronic commerce: The new e-commerce: innovations for conquering current barriers, obstacles and limitations to conducting successful business on the internet ICEC '06**Publisher:** ACM PressFull text available: pdf(503.75 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This paper presents a decentralized model that allows self-interested agents to reach "win-win" agreements in a multi-attribute negotiation. The model is based on an alternating-offer protocol. In each period, the proposing agent is allowed to make a limited number of offers. The responding agent can choose the best offer or reject all of them. In the case of rejection, agents exchange their roles and the negotiation proceeds to the next period. To make counteroffers, an agent first uses ...

Keywords: automated negotiation, multi-attribute negotiation, pareto optimality, performance analysis, rational preference

18 Optimal Negotiation of Multiple Issues in Incomplete Information Settings

Shaheen Fatima, Michael Wooldridge, Nicholas R. Jennings

July 2004 **Proceedings of the Third International Joint Conference on Autonomous Agents and Multiagent Systems - Volume 3 AAMAS '04****Publisher:** IEEE Computer SocietyFull text available: pdf(238.29 KB) Additional Information: [full citation](#), [abstract](#), [citations](#), [index terms](#)

This paper studies bilateral multi-issue negotiation between self-interested agents. The outcome of such encounters depends on two key factors: the agenda (i.e., the set of issues under negotiation) and the negotiation procedure (i.e., whether the issues are discussed together or separately). Against this background, this paper analyses such negotiations by varying the agenda and negotiation procedure. This analysis is carried out in an incomplete information setting in which an agent knows its ...

19 Coordinating Multiple Concurrent Negotiations

Thuc Duong Nguyen, Nicholas R. Jennings

July 2004 **Proceedings of the Third International Joint Conference on Autonomous Agents and Multiagent Systems - Volume 3 AAMAS '04****Publisher:** IEEE Computer SocietyFull text available: pdf(233.61 KB) Additional Information: [full citation](#), [abstract](#), [citations](#), [index terms](#)

To secure good deals, an agent may engage in multiple concurrent negotiations for a particular good or service. However for this to be effective, the agent needs to carefully coordinate its negotiations. At a basic level, such coordination should ensure the agent does not procure more of the good than is needed. But to really derive benefit from such an approach, the agent needs the concurrent encounters to mutually influence one another (e.g. a good price with one opponent should enable an agent ...

20 Posters: negotiation and agreement II: Balancing conflict and cost in the selection of negotiation opponents

Steve Munroe, Michael Luck

July 2005 **Proceedings of the fourth international joint conference on Autonomous agents and multiagent systems AAMAS '05****Publisher:** ACM PressFull text available: pdf(210.44 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Within the context of bi-lateral negotiation, a problem that has received little attention is that of identifying negotiation opponents in situations in which the consequences of conflict and the ability to access resources vary dynamically. Such dynamism poses a number of problems that make it difficult to automate the identification of appropriate negotiation opponents. To that end, this paper describes an opponent selection mechanism used by a buyer-agent to evaluate and select between an alr ...

Keywords: negotiation opponent selection

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21 [Papers: negotiation and agreement I: Negotiating over small bundles of resources](#)



Yann Chevaleyre, Ulle Endriss, Jérôme Lang, Nicolas Maudet

 July 2005 **Proceedings of the fourth international joint conference on Autonomous agents and multiagent systems AAMAS '05**

Publisher: ACM Press

 Full text available: [pdf\(348.32 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

When rational but myopic agents negotiate over the exchange of indivisible resources, any restriction to the negotiation protocol may prevent the system from converging to a socially optimal allocation in the general case. This paper addresses this issue by analysing how the confinement to certain classes of utility functions can enable agents to move to an optimal allocation by negotiating over small bundles of items at a time. In particular, we consider so-called k-separable domains, where the ...

Keywords: multiagent resource allocation, negotiation, social choice and welfare, utility theory

22 [Multi-agent systems and social behavior: Reasoning about commitments in multiple concurrent negotiations](#)



Thuc Duong Nguyen, Nicholas R. Jennings

 March 2004 **Proceedings of the 6th international conference on Electronic commerce ICEC '04**

Publisher: ACM Press

 Full text available: [pdf\(307.16 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#)

Automated negotiation by software agents is a key enabling technology for agent mediated e-commerce. To this end, this paper considers an important class of such negotiations - namely those in which an agent engages in multiple concurrent bilateral negotiations for a good or service. In particular, we consider the situation in which a buyer agent is looking for a single service provider from a number of available ones in its environment. By bargaining simultaneously with these providers and inte ...

23 [Adaptive, Confidence-Based Multiagent Negotiation Strategy](#)



Leen-Kiat Soh, Xin Li

 July 2004 **Proceedings of the Third International Joint Conference on Autonomous Agents and Multiagent Systems - Volume 3 AAMAS '04**

Publisher: IEEE Computer Society

 Full text available: [pdf\(180.40 KB\)](#) Additional Information: [full citation](#), [abstract](#), [index terms](#)

We propose an adaptive 1-to-many negotiation strategy for multiagent coalition formation in dynamic, uncertain, real-time, and noisy environments. Our strategy focuses on multi-issue negotiations where each issue is a request from the initiating agent to the

responding agent. The initiating agent conducts multiple concurrent negotiations with responding agents and in each negotiation it employs (1) a pipelined, one-at-a-time approach, or (2) a confidence-based, packaged approach. In the former, ...

24 Game theory: Contract clause negotiation by game theory



Elisa Burato, Matteo Cristani

June 2007 **Proceedings of the 11th international conference on Artificial intelligence and law ICAIL '07**

Publisher: ACM Press

Full text available: pdf(448.34 KB) Additional Information: [full citation](#), [abstract](#), [references](#)

Several recent investigations in Artificial Intelligence and Law have dealt with the problem of "contract clause negotiation", often seen as a specific type of "meaning negotiation". Though a consistent effort has been spent in modelling situations in which two agents mediate the rules to govern a cooperation stipulated in a contract, there is still a lack of formalisation for such a task from a logical viewpoint, and specifically, no model exists, to the best of our knowledge, in the current ...

Keywords: bargaining, contract clauses negotiation, dialogue games, game theory, knowledge representation, legal knowledge representation, meaning negotiation, multiple agents systems

25 Experiments in Human Multi-Issue Negotiation: Analysis and Support



Tibor Bosse, Catholijn M. Jonker, Jan Treur

July 2004 **Proceedings of the Third International Joint Conference on Autonomous Agents and Multiagent Systems - Volume 2 AAMAS '04**

Publisher: IEEE Computer Society

Full text available: pdf(368.91 KB) Additional Information: [full citation](#), [abstract](#), [index terms](#)

The purpose of this paper is to report on experiments in (human) multi-issue negotiation and their analysis, and to present a generic software environment supporting such an analysis. First, the paper presents a System for Analysis of Multi-Issue Negotiation (SAMIN). SAMIN is designed to analyse negotiation processes between human negotiators, between human and software agents, and between software agents. The user can enter any formal property deemed useful into the system and use the system to ...

26 Interaction through negotiation



Christina Brodersen, Jannie Friis Kristensen

October 2004 **Proceedings of the third Nordic conference on Human-computer interaction NordiCHI '04**

Publisher: ACM Press

Full text available: pdf(205.58 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

In this paper we discuss recent developments in interaction design principles for ubiquitous computing environments, specifically implications related to situated and mobile aspects of work. We present 'Interaction through Negotiation' as a general Human-Computer Interaction (HCI) paradigm, aimed at ubiquitous/pervasive technology and environments, with focus on facilitating negotiation in and between webs of different artifacts, humans and places. This approach is concerned with the way tech ...

Keywords: exception handling, interaction, mobile work, ubiquitous computing, webs of technology


27 Session 1C: trust and reputation: On-line incremental learning in bilateral multi-issue negotiation



Von-Wun Soo, Chun-An Hung

July 2002 **Proceedings of the first international joint conference on Autonomous agents and multiagent systems: part 1 AAMAS '02**

Publisher: ACM Press

Full text available:  pdf(437.80 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

In this paper, we assume agents are cooperative negotiators under bounded number of negotiation messages. We implement agents who could incrementally learn from other agent's proposal during negotiation in order to speed up the negotiation process. We evaluate their performance in terms of Pareto efficiency, total utility payoffs, and number of negotiating messages. The experiments showed that negotiation learning agents could reach closer to the Pareto efficiency agreement in a much faster speed ...

Keywords: incremental learning, multi-issue agent negotiation

28 Multi-Agent based negotiation support systems for order based manufacturers



Hyung Rim Choi, Byung Joo Park, Hyun Soo Kim, Yong Sung Park, Young Jae Park
September 2003 **Proceedings of the 5th international conference on Electronic commerce ICEC '03**

Publisher: ACM Press

Full text available:  pdf(654.66 KB) Additional Information: [full citation](#), [abstract](#), [references](#)

In this research, we have developed a Multi-Agent based Negotiation Support System to enhance the competitive power of a company in dynamic environments and correspond to various orders from customers by capitalizing on electronic commerce. The system uses the agent technology that comes to light as a new paradigm in dynamic environment and flexible system framework. The multi-agent technology is used to solve these problems through cooperation between agents. The system consists of six sub agents ...


Keywords: intelligent agents, multi-agent, negotiation, scheduling and sales engineer, virtual manufacturing

29 Towards Automated Procurement via Agent-Aware Negotiation Support



A. Giovannucci, J. A. Rodriguez-Aguilar, A. Reyes, F. X. Noria, J. Cerquides
July 2004 **Proceedings of the Third International Joint Conference on Autonomous Agents and Multiagent Systems - Volume 1 AAMAS '04**

Publisher: IEEE Computer Society

Full text available:  pdf(470.17 KB) Additional Information: [full citation](#), [abstract](#), [index terms](#)

Negotiation events in industrial procurement involving multiple, highly customisable goods pose serious challenges to buying agents when trying to determine the best set of providing agents' offers. Typically, a buying agent's decision involves a large variety of constraints that may involve attributes of a very same item as well as attributes of multiple items. In this paper we describe iBundler, an agent-aware negotiation service to solve the winner determination problem considering buyers' and ...

30 Automated Multi-Attribute Negotiation with Efficient Use of Incomplete Preference Information



Catholijn Jonker, Valentin Robu
July 2004 **Proceedings of the Third International Joint Conference on Autonomous Agents and Multiagent Systems - Volume 3 AAMAS '04**

Publisher: IEEE Computer Society

Full text available:  pdf(248.04 KB) Additional Information: [full citation](#), [abstract](#), [citations](#), [index terms](#)

This paper presents a model for integrative, one-to-one negotiation in which the values across multiple attributes are negotiated simultaneously. We model a mechanism in which agents are able to use any amount of incomplete preference information revealed by the negotiation partner in order to improve the efficiency of the reached agreements. Moreover, we show that the outcome of such a negotiation can be further improved by incorporating a "guessing" heuristic, by which an agent uses the history ...

31 Relaxed-criteria G-negotiation for Grid resource co-allocation



 Kwang Mong Sim
January 2007 **ACM SIGecom Exchanges**, Volume 6 Issue 2


Publisher: ACM Press

Full text available:  pdf(173.63 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Supporting resource co-allocation is essential for realizing the Grid vision because computational intensive applications may require more resources than a single computing machine can provide in one administrative domain. Given that the various stakeholders often have their own requirements and supply-and-demand patterns, successfully obtaining commitments through concurrent negotiations with multiple resource owners to simultaneously access several resources is a very challenging task. This po ...

Keywords: automated negotiation, bargaining protocol, grid resource co-allocation, grid resource management, resource allocation, software agent

32 Multi-agent systems and social behavior: Agent-based negotiation in cooperative processes: automatic support to underwriting insurance policies

 Marco Comuzzi, Chiara Francalanci

March 2004 **Proceedings of the 6th international conference on Electronic commerce ICEC '04**


Publisher: ACM Press

Full text available:  pdf(335.74 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

In a cooperative context, negotiation represents the process that allows organizations to create a base of common knowledge. Organizations have at the same time shared and divergent objectives and, thus, negotiating the characteristics of a common knowledge base cannot be fully cooperative, but inevitably raises competitive behaviours. The *coopetition* paradigm has been introduced in the literature to model relationships between companies that are simultaneously cooperative and competitive ...

Keywords: insurance industry, negotiation

33 Rewards-based negotiation for providing context information

 Bing Shi, Xianping Tao, Jian Lu

November 2006 **Proceedings of the 4th international workshop on Middleware for Pervasive and Ad-Hoc Computing (MPAC 2006) MPAC '06**

Publisher: ACM Press

Full text available:  pdf(159.56 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

How to provide appropriate context information is a challenging problem in context-aware computing. Most existing approaches use a centralized selection mechanism to decide which context information is appropriate. In this paper, we propose a novel approach based on negotiation with rewards to solving such problem. Distributed context providers negotiate with each other to decide who can provide context and how they allocate proceeds. In order to support our approach, we have designed a concrete ...


Keywords: context, context provider, context-awareness, negotiation

34 Motivation-Based Selection of Negotiation Partners

Steve Munroe, Michael Luck, Mark d'Inverno

July 2004 **Proceedings of the Third International Joint Conference on Autonomous Agents and Multiagent Systems - Volume 3 AAMAS '04**

Publisher: IEEE Computer Society

Full text available:  pdf(129.99 KB) Additional Information: [full citation](#), [abstract](#), [index terms](#)

Negotiation is key to resolving conflicts, allocating resources and establishing cooperation in systems of self-interested agents. Often, an agent may have to select between different potential negotiation partners, and identifying which offers the best chance of a successful

negotiation is a challenging task. However, poor selection of partners can result in failure or in inefficient outcomes. To that end, this paper describes a motivation-based mechanism to evaluate and select between negotiat ...

35 Argumentation and negotiation: Monotonic concession protocols for multilateral negotiation



Ulle Endriss

May 2006

Proceedings of the fifth international joint conference on Autonomous agents and multiagent systems AAMAS '06

Publisher: ACM Press

Full text available: pdf(235.46 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

The most natural way of thinking about negotiation is probably a situation whereby each of the parties involved initially make a proposal that is particularly beneficial to themselves and then incrementally revise their earlier proposals in order to come to an agreement. This idea has been formalised in the so-called monotonic concession protocol, a set of rules defining the range of acceptable moves during a negotiation process intended to follow this general scheme. In the case of negotiation ...

Keywords: game theory, negotiation, protocols

36 E-commerce technologies: A computation environment for automated negotiation: a case study in electronic tourism



Alan Silva, José Alencar Neto, Ig Ibert

March 2007 **Proceedings of the 2007 ACM symposium on Applied computing SAC '07**

Publisher: ACM Press

Full text available: pdf(209.38 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

The automated negotiation topic plays an important role in e-commerce research. However, despite considerable work on automated negotiation, few research efforts have aimed at software engineering facilities such a reuse and flexibility. To address this issue, we propose a novel computation environment for building agents with flexible negotiation strategies to function in various virtual business domains. Regarding the negotiation strategies, some decision taking assistance techniques may be ...

Keywords: agent and multiagent architectures, cognitive models, electronic commerce, trading agents

37 E-marketing & e-businesses: Adaptive negotiation agents for e-business



Raymond Y. K. Lau

August 2005 **Proceedings of the 7th international conference on Electronic commerce ICEC '05**

Publisher: ACM Press

Full text available: pdf(480.11 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Negotiation has been identified as one of the key steps in Business-to-Business (B2B) transaction models. However, developing effective and efficient negotiation mechanisms for e-Business is quite challenging since negotiations in such a context are characterized by combinatorial complex negotiation spaces, tough deadlines, incomplete information about the opponents, and volatile negotiator preferences. Classical negotiation models are not able to offer a satisfactory solution to address all the ...

Keywords: automated negotiation, e-business, evolutionary learning, intelligent agents

38 Learning algorithms for single-instance electronic negotiations using the time-dependent behavioral tactic



Wilson Wai Ho Mok, R. P. Sundarraj

February 2005 **ACM Transactions on Internet Technology (TOIT)**, Volume 5 Issue 1

Publisher: ACM Press

Full text available:  pdf(844.63 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Negotiator often rely on learning an opponent's behavior and on then using the knowledge gained to arrive at a better deal. However, in an electronic negotiation setting in which the parties involved are often unknown to (and therefore lack information about) each other, this learning has to be accomplished with only the bid offers submitted during an ongoing negotiation. In this article, we consider such a scenario and develop learning algorithms for electronic agents that use a common negotiat ...


Keywords: Electronic negotiation, electronic agents, electronic commerce, learning, time-dependent tactic.

39 Strategy Acquisition of Agents in Multi-Issue Negotiation

Shohei Yoshikawa, Takahiko Kamiryo, Yoshiaki Yasumura, Kuniaki Uehara

December 2006 **Proceedings of the 2006 IEEE/WIC/ACM International Conference on Web Intelligence WI '06**

Publisher: IEEE Computer Society

Full text available:  pdf(169.49 KB) Additional Information: [full citation](#), [abstract](#), [index terms](#)

This paper presents a method for acquiring a strategy of an agent in multi-issue negotiation. This method learns how to make a concession to an opponent for realizing win-win negotiation. To learn the concession strategy, we adopt reinforcement learning. First, an agent receives a proposal from an opponent. The agent recognizes a negotiation state using the difference between their proposals and difference between their concessions. According to the state, the agent makes a proposal by reinforce ...

40 Papers: argumentation and dialog: Towards a formal framework for the search of a consensus between autonomous agents

Leila Amgoud, Sihem Belabbès, Henri Prade

July 2005 **Proceedings of the fourth international joint conference on Autonomous agents and multiagent systems AAMAS '05**

Publisher: ACM Press

Full text available:  pdf(285.40 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This paper aims at proposing a general formal framework for dialogue between autonomous agents which are looking for a common agreement about a collective choice. The proposed setting has three main components: the agents, their reasoning capabilities, and a protocol. The agents are supposed to maintain beliefs about the environment and the other agents, together with their own goals. The beliefs are more or less certain and the goals may not have equal priority. These agents are supposed to be ...

Keywords: argumentation, negotiation

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 Terms used: **autonomous agent** AND **negotiation** OR **negotiate**

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41 [Argumentation and negotiation: An expressive approach to fuzzy constraint based agent purchase negotiation](#)

Miguel A. López-Carmona, Juan R. Velasco

 May 2006 **Proceedings of the fifth international joint conference on Autonomous agents and multiagent systems AAMAS '06**
Publisher: ACM Press

 Full text available: [pdf\(384.64 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This paper presents a fuzzy constraint based model for bilateral multi-attribute agent purchase negotiations in competitive trading environments. Argumentation is used as a key mechanism to improve agreements, in contrast to other fuzzy constraint based models which are limited to quantitative offers and counter-offers. A set of locutions and decision mechanisms which fire them are specified, so that each agent may decide its degree of cooperation and expressiveness.

Keywords: fuzzy constraints, negotiation, strategies

42 [Papers: negotiation and agreement I: Negotiation mechanism for TAC SCM component market](#)

Dongmo Zhang

 July 2005 **Proceedings of the fourth international joint conference on Autonomous agents and multiagent systems AAMAS '05**
Publisher: ACM Press

 Full text available: [pdf\(333.90 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This paper presents a new negotiation mechanism and a new supplier model for Trading Agent Competition Supply Chain Management(TAC SCM). Under the new negotiation mechanism, an agent is allowed to negotiate with component suppliers on price, delivery date and supply quantity while a supplier can autonomously vary its production capacity with market demands and allocate its products to buyers through auction. A mathematical analysis is given to ensure the new negotiation mechanism and supplier mo ...

Keywords: multi-agent simulation and modelling, negotiation, trading agent

43 [Coordination models, languages and applications \(CM\): A Negotiation Support System based on a Multi-agent System: specificity and preference relations on arguments](#)

Maxime Morge, Philippe Beaune


 March 2004 **Proceedings of the 2004 ACM symposium on Applied computing SAC '04**

Publisher: ACM PressFull text available:  pdf(166.93 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

In this paper, we propose a Negotiation Support System based on a Multi-agent System. Each agent assists a user in multi-criteria decision making and negotiates according to this decision-modelling with other agents, each of them representing a user. Moreover agents assist users in the debate to negotiate a joint representation of the problem and automatically justify proposals with this joint representation.

Keywords: CSCW, analytic hierarchy process, argumentation, automated negotiation**44** Negotiation to Improve Role Adoption in Organizations

Asad Rahman, Henry Hexmoor

July 2004 **Proceedings of the Third International Joint Conference on Autonomous Agents and Multiagent Systems - Volume 3 AAMAS '04****Publisher:** IEEE Computer SocietyFull text available:  pdf(90.94 KB) Additional Information: [full citation](#), [abstract](#), [index terms](#)

We present negotiation schemes for efficient role adoption that enhance utility in organizations. In one scheme, local utility computations determine role adoption. In the second scheme, utility of the entire system is considered by the negotiating agents. These strategies are compared to the optimal outcome. Our results show that when agents negotiate using the second strategy, the system performance converges to its pareto optimal utility level.

45 Argumentation and negotiation: Negotiation coalitions in group-choice multi-agent systems

Tom Wanyama, Behrouz H. Far

May 2006 **Proceedings of the fifth international joint conference on Autonomous agents and multiagent systems AAMAS '06****Publisher:** ACM PressFull text available:  pdf(150.80 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

In Group-Choice Decision Making (GCDM) where a number of stakeholders are involved in choosing a single solution from a set of available solution options, it is common for the stakeholders to form coalitions during negotiations in order to increase their individual welfare. It is also common to use Multi-Agent Systems (MAS) to automate GCDM processes. In such MAS, agents have to form coalitions like their human counterparts. Within each coalition, the individual agents behave according to the st ...

Keywords: coalition-formation, game-theory, group-choice, negotiation, qualitative-reasoning**46** Agents, interactions, mobility and systems: An automated negotiation mechanism based on co-evolution and game theory

Jen-Hsiang Chen, Kuo-Ming Chao, Nick Godwin, Colin Reeves, Peter Smith

March 2002 **Proceedings of the 2002 ACM symposium on Applied computing SAC '02****Publisher:** ACM PressFull text available:  pdf(471.12 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

The problems associated with current automated negotiation approaches are of little feasibility in practical industry applications. This paper describes a new method that combines a game theory approach and a co-evolutionary approach to support an effective negotiation model for agents to resolve conflict. Under this proposed method, the agents without knowing the other agent's strategies and payoffs, produce an optimised resolution that complies Nash equilibrium and Pareto efficiency concepts. ...

Keywords: game theory, genetic algorithm, no fear of deviation, prisoner dilemma

47 Posters: argumentation and dialog: Argument-based negotiation in a social context

 Nishan C. Karunatillake, Nicholas R. Jennings, Iyad Rahwan, Timothy J. Norman
July 2005 **Proceedings of the fourth international joint conference on Autonomous agents and multiagent systems AAMAS '05**

Publisher: ACM Press

Full text available:  [pdf\(298.07 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Autonomous agents usually operate as a multi-agent community performing actions within a shared social context to achieve their individual and collective objectives. In such a social context, their actions are influenced via two broad forms of motivations. First, the *internal influences* reflect the intrinsic motivations that drive the individual agent to achieve its own internal objectives. Second, as agents reside and operate within a social community, the social context itself influence ...

Keywords: argumentation-based negotiation, conflict resolution

48 Multi-agent systems and social behavior: Learning on opponent's preferences to make effective multi-issue negotiation trade-offs

 Robert M. Coehoorn, Nicholas R. Jennings
March 2004 **Proceedings of the 6th international conference on Electronic commerce ICEC '04**

Publisher: ACM Press


Full text available:  [pdf\(457.36 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

Software agents that autonomously act and interact to achieve their design objectives are increasingly being developed for a range of e-commerce applications. In this context, automated negotiation is a central concern since it is the de facto means of establishing contracts for goods or services between the agents. Now, in many cases these contracts consist of multiple issues (e.g. price, time of delivery, quantity, quality) which makes the negotiation more complex than when dealing with just p ...

49 Semantics, ontologies & enterprise integration track: Concept abduction and contraction for semantic-based discovery of matches and negotiation spaces in an e-marketplace

 Simona Colucci, Tommaso Di Noia, Eugenio Di Sciascio, Marina Mongiello, Francesco M. Donini
March 2004 **Proceedings of the 6th international conference on Electronic commerce ICEC '04**

Publisher: ACM Press

Full text available:  [pdf\(495.44 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

In this paper we present a Description Logic approach to extended matchmaking between Demands and Supplies in an Electronic Marketplace, which allows the semantic-based treatment of negotiable and strict requirements in the description. To this aim we exploit two novel non-standard Description Logic inference services, Concept Contraction -which extends satisfiability- and Concept Abduction -which extends subsumption. Based on these services we devise algorithms to find negotiation spaces and to de ...

Keywords: concept abduction, concept contraction, description logics, e-commerce, matchmaking, negotiable constraints, semantic web

50 Session T6: mechanisms and institutions II: An empirical study of interest-based negotiation

 Philippe Pasquier, Ramon Hollands, Frank Dignum, Iyad Rahwan, Liz Sonenberg

August 2007 **Proceedings of the ninth international conference on Electronic commerce ICEC '07**

Publisher: ACM Press

Full text available:  pdf(812.18 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

While argumentation-based negotiation has been accepted as a promising alternative to game-theoretic or heuristic based negotiation, no evidence has been provided to confirm this theoretical advantage. We propose a model of bilateral negotiation extending a simple monotonic concession protocol by allowing the agents to exchange information about their underlying interests and possible alternatives to achieve them during the negotiation. We present an empirical study that demonstrates (through ...

Keywords: automated negotiation, interest based negotiation

51 Session 5A: agent communication languages: Negotiation as a mechanism for language evolution



Piotr J. Gmytrasiewicz

July 2002 **Proceedings of the first international joint conference on Autonomous agents and multiagent systems: part 2 AAMAS '02**

Publisher: ACM Press

Full text available:  pdf(81.89 KB) Additional Information: [full citation](#), [index terms](#)

52 An agent-based approach to manage negotiation protocols in flexible CSCW systems



Federico Bergenti, Agostino Poggi

June 2000 **Proceedings of the fourth international conference on Autonomous agents AGENTS '00**

Publisher: ACM Press

Full text available:  pdf(218.83 KB) Additional Information: [full citation](#), [references](#), [index terms](#)

Keywords: CSCW systems, negotiation protocols, personal agents

53 Automated negotiation for order transaction of injection mold manufacturer



Young Jae Park, Hyung Rim Choi, Hyun Soo Kim

September 2003 **Proceedings of the 5th international conference on Electronic commerce ICEC '03**

Publisher: ACM Press

Full text available:  pdf(475.22 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Today, there are several markets in cyber space where companies trade electronically due to the development of Information Technology. On the other hand, the most important thing in trades is negotiation. So, in order to support current business practices as well as new ones on the Internet, electronic commerce systems need an ability to negotiate. In this paper, proposed is a method by which a seller can be supported by an agent which plays a role in negotiation process among small and medium c ...

Keywords: and electronic commerce, automated negotiation, intelligent agent

54 Session M6: adaptive communication protocols for e-business: Assimilating ontological additions in convergent negotiation protocols




Bruce Spencer

August 2007 **Proceedings of the ninth international conference on Electronic commerce ICEC '07**

Publisher: ACM Press

Full text available: Additional Information:

 [pdf\(214.30 KB\)](#)[full citation](#), [abstract](#), [references](#), [index terms](#)

We consider negotiation protocols in which each offer contains a price and a description from some given ontology. If the opposing negotiation agents do not share the same version of this ontology, for instance because not all have been made aware of the latest changes, then a fixed communication protocol may be expected to fail when one opponent is faced with an offer including a concept novel to it. However, the communication may proceed if the agent is allowed to ask for, receive and assim ...

Keywords: assimilation, convergent negotiation, negotiating agents, negotiation protocols, ontologies

55 [Agent negotiation in trusted third party mediated uncertain games](#)



Von-Wun Soo

June 2000 **Proceedings of the fourth international conference on Autonomous agents AGENTS '00**

Publisher: ACM Press

Full text available:  [pdf\(207.27 KB\)](#) Additional Information: [full citation](#), [references](#), [index terms](#)

Keywords: agent negotiation, expected utility, rational agents, risk aversion, trusted third party, uncertainty equivalent

56 [Poster paper sessions: AutONA: a system for automated multiple 1-1 negotiation](#)



Andrew Bye, Mike Yearworth, Kay-Yut Chen, Claudio Bartolini, Nir Vulkan

June 2003 **Proceedings of the 4th ACM conference on Electronic commerce EC '03**

Publisher: ACM Press

Full text available:  [pdf\(31.64 KB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

Keywords: agent, bidding, negotiation

57 [Multiagent systems and electronic markets track: Detecting opponent concessions in multi-issue automated negotiation](#)



Scott Buffett, Luc Comeau, Bruce Spencer, Michael W. Fleming

August 2006 **Proceedings of the 8th international conference on Electronic commerce: The new e-commerce: innovations for conquering current barriers, obstacles and limitations to conducting successful business on the internet ICEC '06**

Publisher: ACM Press

Full text available:  [pdf\(457.69 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

An agent engaged in multi-issue automated negotiation can benefit greatly from learning about its opponent's preferences. Knowledge of the opponent's preferences can help the agent not only to find mutually acceptable agreements more quickly, but also to negotiate deals that are better for the agent in question. In this paper, we describe a new technique for learning about an opponent's preferences by observing its history of offers in a negotiation. Patterns in the similarity between the oppone ...

Keywords: automated negotiation, learning, mutli-issue negotiation, negotiation protocols, negotiation strategies, preferences

58 [E-marketing & e-businesses: Learning opponents' preferences in multi-object automated negotiation](#)



Scott Buffett, Bruce Spencer

August 2005 **Proceedings of the 7th international conference on Electronic commerce****ICEC '05****Publisher:** ACM PressFull text available: pdf(397.45 KB) Additional Information: [full citation](#), [abstract](#), [references](#)

We present a classification method for learning an opponent's preferences during a bilateral multi-issue negotiation. Similar candidate preference relations are grouped into classes, and a Bayesian technique is used to determine, for each class, the likelihood that the opponent's true preference relation over the set of offers lies in that class. Evidence used for classification decision-making is obtained by observing the opponents' sequence of offers, and applying the concession assumption, wh ...

Keywords: Bayesian classification, automated negotiation, multi-issue, preference elicitation, utility

59 Argumentation and negotiation: Tractable negotiation in tree-structured domains

Yann Chevaleyre, Ulle Endriss, Nicolas Maudet

May 2006 **Proceedings of the fifth international joint conference on Autonomous agents and multiagent systems AAMAS '06****Publisher:** ACM PressFull text available: pdf(293.25 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Multiagent resource allocation is a timely and exciting area of research at the interface of Computer Science and Economics. One of the main challenges in this area is the high complexity of negotiation. In particular, the complexity of the task of identifying rational deals, *i.e.* deals that are beneficial for all participants, often hinders the successful transfer of theoretical results to practical applications. To address this issue, we propose several protocols designed to tame the co ...

Keywords: multiagent resource allocation, negotiation

60 A formal approach to protocols and strategies for (legal) negotiation

Guido Governatori, Marlon Dumas, Arthur H. M. ter Hofstede, Phillipa Oaks

May 2001 **Proceedings of the 8th international conference on Artificial intelligence and law ICAIL '01****Publisher:** ACM PressFull text available: pdf(145.01 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

We propose a formal and executable framework for expressing protocols and strategies for automated (legal) negotiation. In this framework a party involved in a negotiation is represented through a software agent composed of four modules: (i) a communication module which manages the interaction with the other agents; (ii) a control module; (iii) a reasoning module specified as a defeasible theory; and (iv) a knowledge base which bridges the control and the reasoning modules, while keeping trac ...

Keywords: auctions, automated legal negotiation, defeasible logic, software agents

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